

REMARKS

The Final Office Action mailed July 29, 2002, has been received and reviewed. Claims 25, 26, 31-34, 37-40 and 43-49 are currently pending in the application. Claims 25, 26, 31-34, 37-40 and 43-49 stand rejected. The Office Action of July 29, 2002, states that a request for continued examination was filed and that Applicants' submission filed on May 28, 2002, has been entered. Office Action of July 29, 2002, page 2. Applicants note that a Continued Prosecution Application was filed on June 24, 2002, in response to the Examiner's Advisory Action mailed on June 14, 2002. Applicants respectfully request reconsideration of the application.

35 U.S.C. § 103(a) Obviousness Rejections

Claims 25, 26, 31, 33, 34, 37-40, and 43- 48 stand rejected under 35 U.S.C. § 103(a) ("Section 103") as being unpatentable over U.S. Patent No. 5,545,577 issued to Tada ("Tada") in view of U.S. Patent No. 5,874,325 issued to Koike ("Koike"). Claims 32 and 49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tada and Koike and further in view of U.S. Patent No. 5,846,596 issued to Shim *et al.* ("Shim"). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The examiner bears the burden of establishing that each of these three criteria is met. If one of these criteria is not met, the examiner has not established a *prima facie* case of obviousness.

Obviousness Rejection Based On Tada In View Of Koike

Claims 25, 26, 31, 33, 34, 37-40, and 43-48 stand rejected under Section 103 as being unpatentable over Tada in view of Koike. Applicants respectfully submit that a *prima facie* case of obviousness has not been established because the cited references do not provide a motivation to combine to produce the claimed invention.

Tada discloses "a semiconductor device capable of obtaining a high withstand voltage property." Column 2, lines 59-60. In forming the semiconductor device, a first gate insulating film is formed without being contaminated by a resist layer. As a result, gate oxides of different thicknesses are produced without contacting the resist layer.

Koike discloses a method of manufacturing a semiconductor device that includes a gettering layer. The gettering layer includes a silicon thin film to which impurities have been added. The silicon thin film is applied to both surfaces of a semiconductor surface. Silicon nitride layers are then deposited over the silicon thin film to protect the gettering properties of the silicon thin film layers until the manufacturing process is complete.

Independent claim 25 recites an intermediate structure in the formation of an isolation structure that, among other things, includes a semiconductor substrate having at least a portion that is free of field oxide structures. The semiconductor substrate also has a first and a second opposing surface. The semiconductor substrate has p-wells and n-wells on its first surface. The p-wells comprise at least one activated, annealed n-type area and the n-wells comprise at least one activated, annealed p-type area. The intermediate structure also has a substantially dopant-free, uninterrupted diffusion layer that extends over both the first and second surfaces of the substrate, thereby encapsulating the semiconductor substrate.

As acknowledged by the examiner, Tada does not teach or suggest a substantially dopant-free, uninterrupted barrier layer that extends over the second surface of the substrate. Office Action of July 29, 2002, page 3. Thus, Tada does not disclose that the semiconductor substrate is encapsulated. Applicants respectfully submit that Tada also does not teach or suggest a substantially dopant-free, uninterrupted barrier layer that extends over the first surface of the

substrate. The Examiner asserts that Tada teaches this limitation and cites to column 6, lines 3-32, FIG. 2C, and FIG. 3A of Tada, which discusses diffusion layers 5 and 6 and a base oxide film 4. Office Action of July 29, 2002, page 3. While it is unclear which of these structures the Examiner is referring to, applicants submit that none of these structures are a substantially dopant-free, uninterrupted barrier layer that extends over the first surface of the substrate. The diffusion layers 5 and 6 are not the substantially dopant-free, uninterrupted barrier layer because they are interrupted layers and do not extend over the first surface of the semiconductor substrate. Base oxide film 4 also is not the substantially dopant-free, uninterrupted barrier layer recited in claim 25 because it is not a barrier layer. In addition, base oxide film 4 is not substantially dopant-free because it is formed on the semiconductor substrate before the diffusion layers 5 and 6 are formed.

Assuming *arguendo* that Tada and Koike do in fact teach or suggest all the limitations of claim 25, the cited references nevertheless do not provide a suggestion or motivation to combine to produce the claimed invention. “[T]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” M.P.E.P. § 2143.01. Moreover, the fact that the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without an objective reason to combine the teachings of the references. *Id.* Neither Tada nor Koike suggests the desirability of, nor provides an objective reason for, the combination to produce the claimed invention.

Tada does not suggest the desirability of, or provide an objective reason for, combining the cited references to produce an intermediate structure having a substantially dopant-free, uninterrupted diffusion barrier layer that extends over the first and second surfaces of the semiconductor substrate. Nothing in Tada contemplates encapsulating the semiconductor substrate, let alone encapsulating the semiconductor substrate with a diffusion barrier layer. Therefore, one of ordinary skill in the art would not be motivated, after reading Tada and Koike, to form a substantially dopant-free, uninterrupted diffusion barrier layer that encapsulates the

semiconductor substrate, as recited in claim 25. While Koike discloses that its silicon nitride layer extends over the first and second surfaces of its substrate, Koike does not suggest the desirability of, or provide an objective reason for, forming a silicon nitride layer on both surfaces of other semiconductor substrates. Therefore, one of ordinary skill in the art would not be motivated after reading Koike and Tada to form a substantially dopant-free, uninterrupted diffusion barrier layer that encapsulates the semiconductor substrate, as recited in claim 25.

The Examiner states that it would have been obvious to one of ordinary skill in the art to encapsulate the semiconductor substrate of Tada to prevent the second surface from oxidizing. Office Action of July 29, 2002, page 3. While the nature of the problem to be solved is a possible source of a motivation to combine, the cited references and the claimed invention do not address the same, or even similar, problems. M.P.E.P. § 2143.01. Furthermore, the cited references and the claimed invention do not address the problem identified by the Examiner. Nothing in Tada or Koike teaches or suggests preventing oxidation of the surface of the semiconductor substrate or suggests that encapsulating the semiconductor substrate would solve this problem. The encapsulated substrate in Koike is encapsulated to protect the gettering properties of the underlying silicon thin film layers until the manufacturing process is complete. In addition, the claimed invention does not disclose that its semiconductor substrate is encapsulated to prevent oxidation of the surface. Therefore, one of ordinary skill in the art would not be motivated to combine the cited references to produce the claimed invention to prevent oxidation on the surface of the semiconductor substrate, as asserted by the Examiner.

Rather than preventing oxidation, the claimed invention reduces the encroachment of field oxide structures. However, nothing in the cited references teaches or suggests reducing encroachment of isolation structures and, therefore, one of ordinary skill in the art would not have been motivated to combine Tada and Koike to produce the claimed invention.

Applicants respectfully submit that the Examiner's proposed motivation is not an objective reason, based on properly supported findings, to combine the cited references. As recently explained by the United States Court of Appeals for the Federal Circuit, "it is

fundamental that rejections under 35 U.S.C. § 103 must be based on evidence.” *In re Lee*, 61 U.S.P.Q.2d 1430, 277 F.3d 1338, 1342 (Fed.Cir. 2002). This evidence “must be based on objective evidence of record.” *Id.* at 1343. When patentability depends on a question of obviousness, “rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references” is “the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis.” *Id.* This rigorous showing requires the Examiner to “explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.” *Id.* In other words, the motivation to combine can not “be resolved on subjective belief and unknown authority.” *Id.* at 1344. Furthermore, the Examiner “cannot rely on conclusory statements when dealing with particular combinations of prior art and specific claims, but must set forth the rationale on which it relies.” *Id.* at 1345.

The Examiner’s statement that it would be obvious to encapsulate the semiconductor substrate of Tada to prevent the second surface from oxidizing is conclusory and is not based on any findings or rationale. The Examiner has not presented any objective evidence that one of ordinary skill in the art would have been motivated to combine the cited references to produce the claimed invention. On the contrary, in every office action detailing this rejection, the Examiner has merely stated that the combination would have been obvious to prevent the second surface from oxidizing.

The Examiner also asserts that applicants have “silently” agreed to the motivation to combine. Office Action of July 29, 2002, page 6. However, applicants have not agreed to a motivation to combine and have repeatedly argued against any such motivation to combine. The Examiner has identified one response where applicants did not argue against the motivation to combine and instead argued that the claimed invention was not obvious because the cited references did not teach or suggest all the claim limitations. However, by doing so, applicants did not acquiesce to the motivation presented by the Examiner or waive their right to further argue this issue. Applicants are not required to present every reason or argument for patentability

in each and every response to the office action during the course of the prosecution of a case. To require this would ensure that responses to office actions would be extraordinarily lengthy.

Applicants have not acquiesced to the motivation to combine because in at least eight responses, applicants have argued against any motivation to combine. See for example applicants' response filed on May 28, 2002; applicants' response filed on October 15, 2001; applicants' supplemental response to final rejection filed on July 5, 2001; applicants' response filed on April 12, 2001; applicants' response filed on November 28, 2000; applicants' response filed on July 14, 2002; applicants' response filed on June 19, 2000; and applicants' response filed on February 3, 2000. These responses have consistently argued against the Examiner's proposed motivation to combine, thereby indicating that applicants strongly contest that a motivation to combine the cited references exists.

The Examiner also states that the applicants' arguments on obviousness are directed to the individual references. However, applicants' arguments are directed to the combination of the cited references. Specifically, applicants' arguments point out that there is no motivation or suggestion to combine the cited references to produce the claimed invention.

Since the cited references do not provide a motivation to combine to produce the claimed invention, the rejection of claim 25 should be withdrawn.

Dependent claims 26 and 31 include all of the claim limitations of claim 25 and, therefore, are allowable, *inter alia*, as depending from an allowable claim.

Claim 33 stands rejected under Section 103 as being unpatentable over Tada in view of Koike. Applicants respectfully submit that the rejection of claim 33 is improper because the cited references do not provide a suggestion or motivation to combine to produce the claimed invention.

Claim 33 recites an intermediate structure in the formation of an isolation structure for a semiconductor device. The intermediate structure comprises a semiconductor substrate having at least a portion that is free of field oxide structures. The semiconductor substrate also has a first and second surface. The semiconductor substrate has at least one p-well and at least one n-well

on its first surface. The p-wells and n-wells comprise at least one activated, annealed doped area. The intermediate structure also has a substantially dopant-free, uninterrupted diffusion barrier layer that extends over both the first and second surfaces of the substrate, thereby encapsulating the semiconductor substrate.

Applicants respectfully submit that Tada and Koike do not provide a motivation to combine to produce the claimed invention for the same reasons discussed above for claim 25. Therefore, applicants submit that a *prima facie* case of obviousness of claim 33 has not been established and request that the rejection of claim 33 be withdrawn.

Dependent claims 34, 37, and 38 include all of the claim limitations of claim 33 and, therefore, are allowable, *inter alia*, as depending from an allowable claim.

Claim 39 stands rejected under Section 103 as being unpatentable over Tada in view of Koike. Applicants respectfully submit that the rejection of claim 39 is improper because Tada and Koike do not provide any suggestion or motivation to combine the references.

Claim 39 recites an intermediate structure in the formation of an isolation structure for a semiconductor device. The intermediate structure comprises a semiconductor substrate that has at least a portion free of field oxide structures. The semiconductor substrate also has a first surface and a second surface. The semiconductor substrate has at least one activated, annealed first doped area on its first surface and at least one activated, annealed second, differently doped area within the at least one first doped area. The intermediate structure also comprises a substantially dopant-free, uninterrupted diffusion barrier layer that extends over the first and second surfaces of the semiconductor substrate, thereby encapsulating the semiconductor substrate.

Tada and Koike do not provide a motivation to combine to produce the claimed invention for the same reasons discussed above for claim 25. Therefore, applicants submit that a *prima facie* case of obviousness of claim 39 has not been established and request that the rejection of claim 39 be withdrawn.

Dependent claims 40 and 43-45 include all of the claim limitations of claim 39 and, therefore, are allowable, *inter alia*, as depending from an allowable claim.

Claim 46 stands rejected under Section 103 as being unpatentable over Tada in view of Koike. Applicants respectfully submit that the rejection of claim 46 is improper because Tada and Koike do not provide a suggestion or motivation to combine the references to produce the claimed invention.

Claim 46 recites an intermediate structure useful in the formation of electrical device isolation structures. The intermediate structure comprises a semiconductor substrate that has at least a portion that is free of field oxide structures. The semiconductor substrate also includes a first surface and a second surface, with the first surface opposing the second surface. The semiconductor also has at least one p-well and at least one n-well defined on its first surface. In addition, at least one activated, annealed p-type area is defined within the one n-well and at least one activated, annealed n-type area is defined within the p-well. A substantially dopant-free, uninterrupted diffusion barrier layer extends over the first and second surfaces, thereby encapsulating the semiconductor substrate.

Tada and Koike do not provide a motivation to combine to produce the claimed invention, for the same reasons discussed above with claim 25. Therefore, applicants submit that a *prima facie* case of obviousness of claim 46 has not been established and respectfully request that the rejection of claim 46 be withdrawn.

Dependent claims 47 and 48 include all of the claim limitations of claim 46 and, therefore, are allowable, *inter alia*, as depending from an allowable claim.

Obviousness Rejection Based on Tada and Koike and further in view of Shim

Claims 32 and 49 stand rejected under Section 103 as being unpatentable over Tada and Koike as applied to claims 25 and 46 above, and further in view of Shim. Applicants respectfully submit that a *prima facie* case of obviousness has not been established because Tada, Koike, and Shim do not provide a motivation to combine to produce the claimed invention.

Shim discloses a method of forming field oxide isolation regions having sloped edges. A silicon nitride or silicon oxynitride layer is applied to one surface of a substrate and is used as a first oxidation resistant layer. The first oxidation resistant layer, in combination with a first pad insulation layer, is patterned to expose portions of the substrate, which are subsequently oxidized into field oxide isolation regions having sloped edges.

Since claim 32 depends from claim 25, it includes all the claim limitations of claim 25. Therefore, claim 32 recites an intermediate structure in the formation of an isolation structure that, among other things, includes a semiconductor substrate having at least a portion that is free of field oxide structures. The semiconductor substrate also has a first and a second opposing surface. The semiconductor substrate has p-wells and n-wells on its first surface. The p-wells comprise at least one activated, annealed n-type area and the n-wells comprise at least one activated, annealed p-type area. The intermediate structure also has a substantially dopant-free, uninterrupted diffusion layer that extends over both the first and second surfaces of the substrate, thereby encapsulating the semiconductor substrate. The substantially dopant-free, uninterrupted diffusion barrier layer is silicon oxynitride.

Claim 32 is not obvious for the reasons discussed above for claim 25 because Shim does not cure the deficiencies in Tada and Koike. Specifically, Shim does not provide a motivation to combine the references because it does not provide the desirability of, or an objective reason for, a substantially dopant-free, uninterrupted diffusion barrier layer that extends over the first and second surfaces of the semiconductor substrate. Shim is cited by the Examiner to show that silicon oxynitride is used in the diffusion barrier layer. Finally, the nonobviousness of independent claim 25 precludes the rejection of claim 32, which depends from claim 25, because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988); *see also* M.P.E.P. § 2143.03.

Since a *prima facie* case of obviousness has not been established, applicants respectfully request that the rejection of claim 32 be withdrawn.

Similarly, since claim 49 depends from claim 46, it includes all the claim limitations of claim 46. Therefore, as amended, claim 49 recites an intermediate structure useful in the formation of electrical device isolation structures. The intermediate structure comprises a semiconductor substrate that has at least a portion that is free of field oxide structures. The semiconductor substrate also includes a first surface and a second surface, with the first surface opposing the second surface. The semiconductor also has at least one p-well and at least one n-well defined on its first surface. In addition, at least one activated, annealed p-type area is defined within the one n-well and at least one activated, annealed n-type area is defined within the p-well. A substantially dopant-free, uninterrupted diffusion barrier layer extends over the first and second surfaces, thereby encapsulating the semiconductor substrate. The substantially dopant-free, uninterrupted diffusion barrier layer recited in claim 49 is silicon oxynitride

Claim 49 is not obvious for the same reasons discussed above for claim 46 because Shim does not cure the deficiencies in Tada and Koike. Specifically, Shim does not provide a motivation to combine the references because it does not provide the desirability of, or an objective reason for, a substantially dopant-free, uninterrupted diffusion barrier layer extending over the first and second surfaces of the semiconductor substrate. Shim is cited by the Examiner to show that silicon oxynitride is used in the diffusion barrier layer. Finally, the nonobviousness of independent claim 46 precludes the rejection of claim 46, which depends from claim 49, because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988); *see also* M.P.E.P. § 2143.03.

Since a *prima facie* case of obviousness has not been established, applicants respectfully submit that the rejection of claim 49 be withdrawn.

CONCLUSION

Claims 25, 26, 31-34, 37-40 and 43-49 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact applicants' undersigned attorney.

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